

THE GENUS NESTEGIS FROM NEW ZEALAND

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THE FOUR REPRESENTATIVES of the Oleaceae native to New Zealand form a closely related group which is characterized, in particular, by the lack of a corolla. Endlicher (Prodr. Fl. Norfolk. 56. 1833), when publishing a description of the first known species, under Vahl's name *Olea apetala*, proposed a separate section, *Gymnelaea*, to accommodate it, and Spach (Hist. Nat. Vég. Phan. 8: 258. 1839) raised the section to generic rank. However Rafinesque, scoffing at the idea of an apetalous *Olea*, had proposed generic separation a year earlier than this, and validly, if sketchily, published the name *Nestegis* (Sylva Tellur. 10. 1838). Nevertheless this apetalous condition is not unique in the family for it is also found in two Asiatic species of *Olea*, in the New World *Forestiera*, and in many members of the predominantly temperate genus *Fraxinus*.

After being ignored for over a century the genus was recently revived by Johnson (as *Gymnelaea*, Contr. New S. Wales Nat. Herb. 2: 411. 1957 and as *Nestegis* in Degener, New Ill. Fl. Hawaiian Is. 300. Nestegis. 1958). There is no doubt that the New Zealand species are not members of *Olea* in the strict sense, although until 1957 this had been their traditional classification. On the other hand the exact delimitation of *Nestegis* is not clear. The affinity of the New Zealand species lies with plants from New Caledonia which I have recently, if conservatively, treated in the genus *Osmanthus* (Jour. Arnold Arb. 44: 268-283. 1963), with Australian plants belonging to *Notelaea*, and I believe, with members of the predominantly Malaysian genus *Linociera*. Lack of petals makes it difficult to assess affinities with these other genera whose diagnostic characters are primarily features of the corolla. Furthermore, since the four New Zealand species form, amongst themselves, a compact natural group it seems best, for the present, at least, to treat them in a separate genus, for which *Nestegis* is the oldest name.

The species included in this revision are usually described as dioecious but the situation cannot be so simply defined. From an examination of the specimens cited in the accounts which follow, it became apparent that monoecism also occurs and, in addition, flowers may be unisexual or hermaphrodite, even on the same inflorescence or branch. Most flowers were found to be unisexual, either female with nonfunctional stamens or male with abortive ovaries, but hermaphrodite flowers with a fully developed ovary or with one which is diminutive yet apparently functional have also been seen. The unisexual flowers are not uniform either. Female flowers with no stamens, with small abortive stamens, or with fully developed yet apparently empty stamens have been found, as have male flowers with ovaries of different sizes. Nor does the sexual expression

appear to be constant from year to year, for in one gathering of *Nestegis cunninghamii* (Healy 52/46) bearing male flowers only (each with an abortive ovary) fruits from the previous year were still carried on the same shoots. Clearly, observations on the variability in sex expression are needed on living plants, carried out over a period of years, between different trees as well as between different branches and inflorescences of the same tree. The number of stamens in each flower is also variable. Two is the characteristic number, but except for *N. cunninghamii*, three and four have been seen in each species, and in *N. lanceolata* some flowers with six have been found. Nor is this variation confined to functional stamens alone for two, three, or four abortive ones may be developed in female flowers.

Like many woody plants of New Zealand the species of *Nestegis* have juvenile leaves which are quite dissimilar from those of the adult plant, leading to difficulties in identification when immature specimens are taken. There is need for more careful collecting to illustrate the authentic juvenile foliage of each species. It appears, however, that when immature, *Nestegis apetala* differs markedly from the other species in possessing leaves which may be broader than the adult and are certainly broader in proportion to their length, whereas the other species have juvenile leaves which are usually much narrower than the adult, and in proportion to their breadth, clearly narrower. Even *N. montana*, which shows the least difference between adult and juvenile foliage has immature leaves which are no broader than the adult and may be longer.

Affinities between these four New Zealand species are conjectural. *Nestegis montana* and, especially, *N. cunninghamii* both possess distinct calyx tubes which may indicate some relationship, but the latter species has inflorescences and young shoots densely hairy, often almost tomentose, with distinctive hairs broadest at the base, and more or less appressed. *N. montana* possesses a scattered puberulence in these same parts but with more slender, erect hairs different in aspect. A puberulence similar to this is exhibited by *N. lanceolata* and the New Zealand material of *N. apetala*, in which, however, the calyces lack a distinct tube. In leaf type each species is distinctive and there are few morphological characters which can be used to assess affinities.

I should like to express my grateful thanks and appreciation to the directors and curators of the cited herbaria for the loan of material or facilities for study. All the material cited has been examined, and the respective herbaria are indicated by the abbreviations published in the *Index Herbariorum*, Ed. 4, 1959. I should particularly like to thank Dr. Lucy B. Moore of New Zealand for information and helpful criticism based upon her knowledge of the species in the field, and Miss Judith Kroll for the drawing of the figures.

KEY TO THE SPECIES

1. Adult leaves up to 3 times as long as broad, elliptic to broadly elliptic, occasionally slightly ovate or lanceolate; juvenile leaves broadly elliptic to rotund, about twice as long as broad or less, broader in proportion than the

adult; primary veins of leaf, where visible, 5-7(-8) per side; shoots glabrous even when young. Norfolk Island and northern parts of North Island, New Zealand. 1. *N. apetala*.

1. Adult leaves 4 or more times as long as broad, usually narrowly lanceolate to linear, at the most (and rarely) lanceolate or elliptic; juvenile leaves narrowly lanceolate to linear, at least 6 times as long as broad, narrower in proportion than the adult; primary veins of leaf, where visible, 4-12 or more per side; shoot glabrescent or pubescent, at least when young, sometimes minutely so. New Zealand.
2. Leaves when adult 1 cm. or more broad, lanceolate, narrowly lanceolate or elliptic, primary veins usually more or less visible; petiole (3-)4-17 mm. long.
3. Midrib above, and primary veins, flush or slightly raised above surface of lamina, glabrous or glabrate, rarely pubescent, 4-6(-7) per side (more or less obscure in juvenile leaves); inflorescence only puberulous, sometimes sparingly so towards the top; calyx divided almost to the base, tube (where developed) less than 1 mm. long. 2. *N. lanceolata*.
3. Midrib above, and primary veins to some extent, impressed below surface of lamina, pubescent when young, 8-10 per side (-12, or obscure in juvenile leaves); inflorescence densely pubescent, almost tomentose, at least before fruiting; calyx more or less campanulate with distinct tube 1-2 mm. long (FIG. 3). 3. *N. cunninghamii*.
2. Leaves when adult less than 1 cm. broad; linear or very narrowly lanceolate, primary veins completely obscure or only barely visible; petiole 3 mm. long or less. 4. *N. montana*.

1. *Nestegis apetala* (Vahl) L. Johnson in Degener, New Ill. Fl. Hawaiian Is. 300. *Nestegis*. 1958.

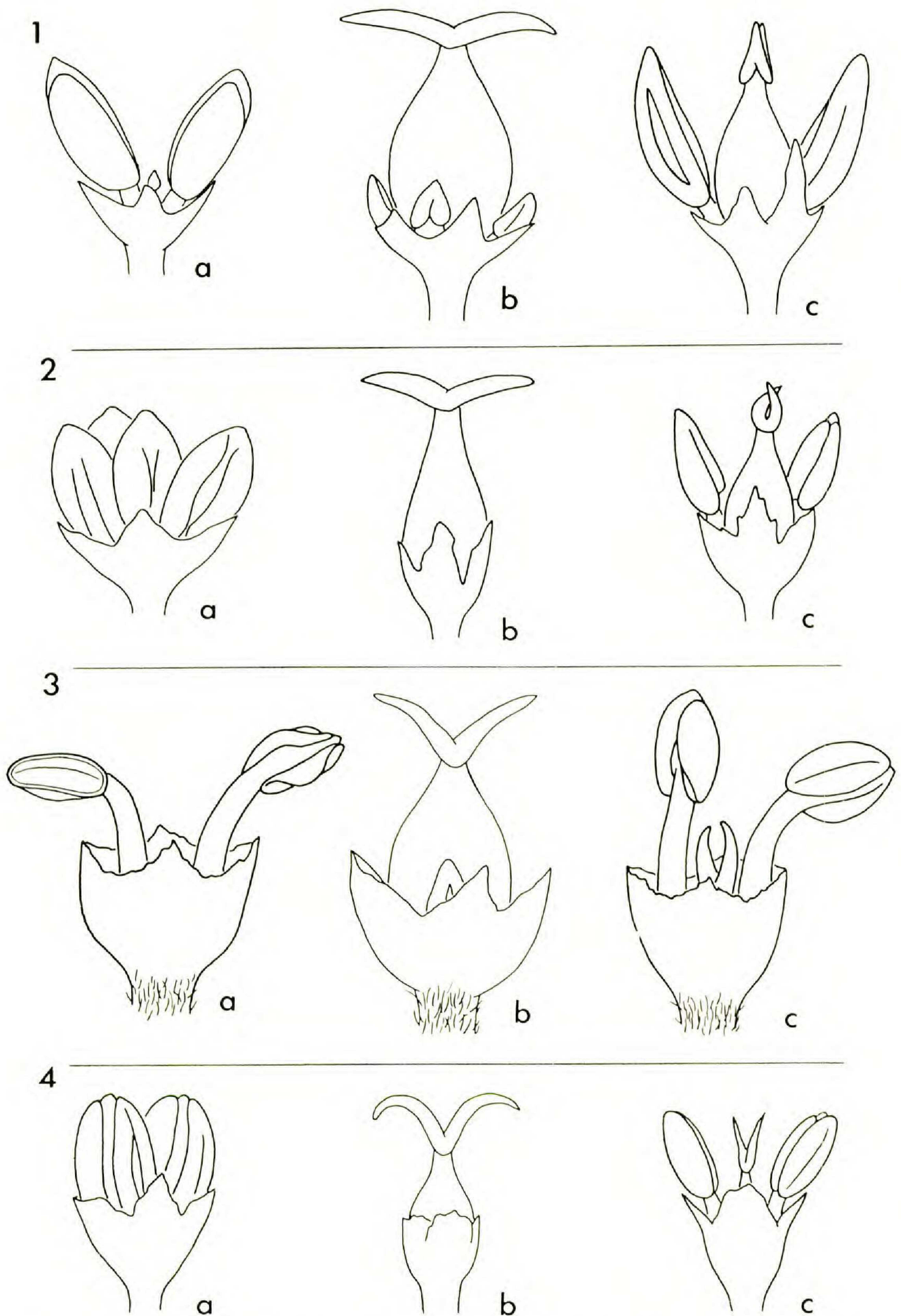
Olea apetala Vahl, Symb. Bot. 3: 3. 1794 et Enum. Pl. 1: 42. 1804; Willdenow, Linn. Sp. Pl. ed. 4. 1: 46. 1797; Martyn in Miller, Gard. Dict. ed. 9. 2: Olea, no. 5. 1807; Roemer & Schultes, Syst. Veg. 1: 71. 1817; Endlicher, Prodr. Fl. Norfolk. 56. 1833 et Ic. Gen. Pl. *pl.* 54. 1838; G. Don, Gen. Syst. 4: 48. 1837; A. Cunningham, Ann. Nat. Hist. 2: 46. 1839; De Candolle, Prodr. 8: 284. 1844; Kirk, Trans. New Zealand Inst. 3: 165. 1871; F. Mueller, Fragmenta Phytogr. Austral. 8: 43. 1873, *ibid.* 9: 169. 1875; Kirk, Trans. New Zealand Inst. 14: 375. 1882 et Forest Fl. New Zealand, 37, 38, *pls.* 27, 28. 1889; Cheeseman, Man. New Zealand Fl. 437. 1906 et ed. 2. 718. 1925; Allan, New Zealand Trees & Shrubs, 132. 1928; Cockayne & Turner, Trees of New Zealand, 139. 1928; Cranwell & Moore, Rec. Auck. Inst. Mus. 1: 308, 309. 1935; Allan, Fl. New Zealand, 1: 545. 1961.

Nestegis elliptica Rafinesque, Sylva Tellur. 10. 1838, *nom. illegit.*

Olea endlicheri F. Mueller, Fragmenta Phytogr. Austral. 8: 43. 1873 et Jour. Bot. 23: 354. 1885.

Gymnelaea apetala (Vahl) L. Johnson, Contr. New S. Wales Natl. Herb. 2: 412. 1957; Allan, Fl. New Zealand 1: 1025. 1961.

Shrub or small tree, 3-6 m. tall, monoecious or dioecious, branches glabrous, spreading, often tortuous (*vide* Kirk), bark grayish brown, thick and furrowed (*vide* Kirk). *Leaves* glabrous, petiole 6-14(-20) mm. long,



FIGS. 1-4, all $\times 7$. A selection of individual flowers (a, male; b, female; c, hermaphrodite) of: 1, *Nestegis apetala*; 2, *N. lanceolata*; 3, *N. cunninghamii*; 4, *N. montana*. (1a & c drawn from Robinson 232; 1b, Kirk 54; 2a, Kirk 203; 2b, Kirk s.n. (A); 2c, Zotov (CHR 48665); 3a, Poole (CHR 69138); 3b, Kirk s.n. (GH); 3c, Healy 53/870; 4a, Druce (CHR 82400); 4b & c Mason 2546).

glabrous; lamina coriaceous, elliptic to broadly elliptic, occasionally slightly ovate or lanceolate, or even rotund when juvenile, (4.5–)5–11(–12.5) cm. long by (1.5–)1.8–4(–6) cm. broad (up to 14 cm. by 8.5 cm. when juvenile); margin entire, slightly thickened, more or less undulate; apex acute or subacuminate, occasionally subapiculate, often slightly recurved; base attenuate or acute (or rounded in juvenile leaves), slightly decurrent onto the petiole; venation usually obscure, only primary veins sometimes barely visible, 5–7(–8) per side; midrib above usually flush with the lamina surface. *Inflorescence* axillary, decussate, opposite-flowered (occasionally subopposite) often borne below the leaves, 1–3 per axil, 1.5–5 cm. long, 11–21-flowered (rarely 4 flowers per node), glabrous or with minute scattered puberulence (in New Zealand plants only); bracts concave, ovate or lanceolate, 2–3 mm. long, early deciduous. Flowers unisexual or hermaphrodite (FIG. 1), pedicels 1–5 mm. long. *Calyx* glabrous with 4, unequal, often irregularly shaped or deeply erose teeth, (0.2–)0.5–1.5 mm. long. *Corolla* absent. *Stamens* 2, occasionally to 4, in hermaphrodite or male flowers, anthers 1.8–2.2 mm. long on broad filaments 0.2–0.5 mm. long; in female flowers nonfunctional 0.5–1 mm. long. *Ovary* in hermaphrodite or female flowers 1.5–3 mm. long with 2 stigmatic lobes 0.5–1.5 mm. long; in male flowers abortive, 0.5 mm. long with undeveloped stigmatic lobes. *Drupe* oblong-ovoid, slightly asymmetrical, 10–15 mm. long by 6–7 mm. broad, red (*vide* Cheeseman); endocarp hard, 0.3 mm. thick.

HOLOTYPE: New Zealand, without locality, *ex Herb. Vahl* (o).

Norfolk Island. *Ferd. Bauer* (*ex Herb. Endlicher*, w); *A. Cunningham* 1 (κ); Nov. 1898, *Robinson* 153 (NSW); 1902, *Robinson* 232 (NSW); May 1904, *Robinson s.n.* (κ); Nov. 1902, *Maiden & Boorman s.n.* (NSW); 11 Oct. 1962, *Ralston* (CHR 130986–130991); *Metcalf s.n.* (NSW).

New Zealand. NORTH ISLAND: Bay of Islands, near Motuaroa, Dec. 1769, *Banks & Solander s.n.* (E); Bay of Islands, near Oke Bay, Dec. 1956, *Atkinson* (CHR 97054A & B); Aorangi Island, Poor Knights Islands, 24 Apr. 1961, *Newhook* (CHR 97311 A & B); Big Chicken, Hen and Chicken Islands, coastal forest, 18 Feb. 1962, *Reynolds* (CHR 12908 A & B); Taranga Island, *Kirk* 517 (GH), March 1869, *Kirk* 166 (κ), 1875, *Hector s.n.* (GH, P) and *Cheeseman s.n.* (NSW, NY); Great Barrier Island, *Kirk s.n.* (GH) and Jan. 1868, *Kirk* 54 p.p. (κ); Nelson Island, May 1868, *Kirk* 54 p.p. (κ). Without definite locality, *ex Herb. Vahl* (holotype, o).

Since, at the time of its first description, the most distinctive feature of this species was its lack of corolla, the epithet *apetala* seemed most appropriate. However, when later collections from New Zealand revealed other species without petals a certain amount of confusion arose which also involved the type locality. Allan (*Fl. New Zealand*, 1: 545. 1961) gives this locality as Norfolk Island, but Vahl's holotype is labelled "Nova Zelandia" and there is no reason to doubt that this is correct and that the specimen was collected on either Captain Cook's first or second voyage. However, the first full description and illustration were published by Endlicher and based on the plant from Norfolk Island. Mueller, without indicating how they may be distinguished, separated the Norfolk Island

plant as a species, *Olea endlicheri*, but on the basis of geographical distribution alone this action is not justified. The fact that all the species from New Zealand are apetalous misled several early workers, a point further discussed under *Nestegis cunninghamii*, the species with which there seems to have been the most confusion.

To judge from the material of *Nestegis apetala* available for this investigation there is one minor character by which the Norfolk Island plant may be distinguished from the New Zealand material. The inflorescences in all the material from the former area have proved to be completely glabrous whereas every specimen examined from New Zealand has a minute and scattered puberulence on the inflorescence rachis. It would be interesting if this difference could be checked on an even wider range of material.

Nestegis apetala has an inflorescence and flowers similar to *N. lanceolata*, although the inflorescence is more robust. Of all four species *N. apetala* is distinct in having leaves which are the broadest in proportion to their length, a character especially evident in the juvenile foliage, which, as has been pointed out above, is unique within this group. Although occurring in Norfolk Island, *N. apetala* is the least widely distributed of the species in New Zealand, occurring only in the northern parts of North Island as far south as Great Barrier Island and now, I am informed by Dr. Lucy B. Moore, known almost exclusively from islands off the Auckland east coast where it is, in places, locally dominant in low coastal forest.

2. *Nestegis lanceolata* (Hooker f.) L. Johnson in Degener, New Ill. Fl. Hawaiian Is. 300. *Nestegis*. 1958.

Olea lanceolata Hooker f. Fl. Nov.-Zeland. 1: 176. 1852 et Handbook New Zealand Fl. 186. 1864; Kirk, Trans. New Zealand Inst. 14: 377. 1882 et Forest Fl. New Zealand, 107, 108, pls. 60, 61. 1889; Laing & Blackwell, Plants New Zealand, 334. 1906 et ed. 5. 355. 1950; Cheeseman, Man. New Zealand Fl. 438. 1906 et ed. 2, 719. 1925, et Ill. New Zealand Fl. 2: pl. 134. 1914; Allan, New Zealand Trees & Shrubs, 132. 1928; Cockayne & Turner, Trees of New Zealand, 93. 1928; Bailey & Bailey, Hortus, 423. 1930, et Hortus Second, 507. 1941; Gudex, Trans. Roy. Soc. New Zealand, 85: 58. 1957; Allan, Fl. New Zealand 1: 546. 1961.

Gymnelaea lanceolata (Hooker f.) L. Johnson, Contr. New S. Wales Natl. Herb. 2: 412. 1957; Allan Fl. New Zealand, 1: 1025. 1961.

Tree to about 15 m. tall (*vide* Kirk) with trunk to about 1 m. in diameter (*vide* Kirk), monoecious or dioecious, branches puberulous. *Leaves* glabrous, petioles (3-)4.5-11 mm. long, puberulous, at least when young; lamina thickish or coriaceous, (narrowly ovate to) lanceolate or narrowly lanceolate (to very narrowly lanceolate or almost linear in juvenile leaves), (3.5-)5-9(-11) cm. long by (0.7-)1-2.5(-3.5) cm. broad (6-13 cm. long or more by 0.4-0.8 cm. broad in juvenile leaves); margin entire, scarcely thickened; apex acute; base attenuate, acute, slightly decurrent onto the petiole; venation with primary veins usually visible, 4-6(-7) per side (more or less obscure in juvenile leaves), sometimes obscurely reticulate, midrib above flush or slightly raised above lamina surface. *Inflorescence*

axillary, decussate, 1–3 per axil, 1–3 cm. long, 11–17-flowered, somewhat slender, puberulous, sometimes sparingly so towards the apex; bracts ovate to lanceolate, slightly concave, 1–2 mm. long, early deciduous. Flowers unisexual or hermaphrodite (FIG. 2), pedicels 0.5–3 mm. long. *Calyx* glabrous, deeply divided almost to the base into 4 unequal, irregular, often somewhat erose teeth, 0.5–1.5 mm. long, or with a tube at the most 0.5 mm. long, often smaller in the male than the female. *Corolla* absent. *Stamens*, in male flowers 2–4(–6), anthers 1–2 mm. long with a scarcely discernible blunt appendage; filament broad 0.3–0.5 mm. long; in female flowers a scarcely discernible subtriangular stump 0.1 mm. high or 2(–4) non-functional anthers 1.5–2 mm. long, acute, filament broad 0.5–1 mm. long. *Ovary* in female flowers 1.5–3 mm. long with 2 stigmatic lobes 1–1.5 mm. long; in male flowers abortive, more or less conical, 0.3–1 mm. high. *Drupe* ellipsoid or oblong-ellipsoid, 8–11 mm. long by 4–5 mm. broad, crimson (*vide* Hooker), red, or orange (*vide* Cheeseman); endocarp hard 0.3–0.6 mm. thick.

LECTOTYPE: New Zealand, without locality, *Colenso?* or *Sinclair?* *s.n.* (K — see below).

New Zealand. NORTH ISLAND: "Radar" bush, Te Paki Station, Far North, forest, 31 Dec. 1953, *Moore* (CHR 83637); Kaiaka, Dec. 1902, *Carse s.n.* (CHR 11046, o); 3 m. W. of Broadwood, Hokianga Co., 10 Nov. 1961, *Melville* 5284 (CHR 130633); Waipoua Forest, forest with high canopy, 7 Nov. 1961, *Moore* (CHR 129162–3); Waipoua, kauri forest, 7 Nov. 1961, *Melville* (5210) & *Moore* (CHR 130563); Warkworth, without collector (CHR 7842); Warkworth, N. Auckland, Jan. 1930, *Moore* (CHR 40594); Mahurangi, *Kirk s.n.* (A); Simpson's Bush, Warkworth, 3 Jan. 1946, *Moore* (CHR 52896); Cowan's Bay Road, Rodney County, bush edge, 4 Jan. 1962, *Moore* (CHR 125571–2); Little Barrier Island, 19 Feb. 1905, *Cockayne* 9144 (E); Great Barrier Island, *Kirk* 83 & *s.n.* (K); Cape Colville, Stony Bay, 193–, *Moore* (CHR 40604); Auckland, May 1947, *Gibbs* (CHR 118760); Swanson, rain forest, April 1933, *Mason* (CHR 22016); Huia River, Manukau, April 1871, *Cheeseman s.n.* (E, NY); Thames range, *Tryon s.n.* (BRI); Thames Gold Field, *Kirk s.n.* (GH); Tairua, Thames, *Adams s.n.* (K); Tolago Bay, Aug. 1929, *Meebold* 4960 (NY); Ohakune Track, Mt. Ruapehu, 22 Oct. 1945, *Mason* (CHR 54046); Tarawera, Hawke's Bay, 2 Feb. 1909, *Petrie* (CHR 118759); Ruahine-Cook botanical district, Merry Hill, Feilding, in rain forest, March 1926, *Allan* (CHR 11040, GH); Feilding, without collector, (CHR 11059); forest near Feilding, Dec. 1924, *Allan s.n.* (NY); Mauriceville, near Mt. Bruce, 5 Feb. 1945, *Zotov* (CHR 48665, 77632, & 112476); Western Lake Reserve, Wairarapa, 4 May 1958, *Moore* (CHR 129157); Lake Pouñui, S. W. Wairarapa, forest remnant, 3 Sept. 1960, *Macmillan* (CHR 129160); Featherston, Wairarapa, Dec. 1959, *Moore* (CHR 129156) and 20 May 1960, *Taylor* (CHR 129287); Featherston, Wairarapa, Abbott's Creek, forest remnant, 17 March 1953, *Healy* 53/520 (CHR 83229); Maidstone Park, Upper Hutt, 17 Dec. 1952, *Healy* 52/469 (CHR 84664), Dec. 1952, *Healy* 52/46 (CHR 88458 A–D), 31 Dec. 1952, *Healy* 52/521 (CHR 84661 A–C), and 10 Jan. 1953, *Healy* 53/71 (CHR 84662 A–E); near Upper Hutt, beech forest remnant, 3 Feb. 1953, *Healy* 53/245 (CHR 83228 A–D); back of racecourse, Trentham, forest remnant, stony flats, 7 Jan. 1953, *Healy* 53/32 (CHR 84660 A & B); Animal Research Station, Wallaceville, forest remnant on stony flats, 2 Apr. 1953, *Healy* S/53/680 (CHR

82995 & 88442 A & B) and 18 Dec. 1952, Healy 52/476 (CHR 84663 A-C); Wellington, in bush, 600 m., rare, March 1909, Travers s.n. (P). Without locality: 1826 A. Cunningham 65 & s.n. (K); Sinclair s.n. (BRI, E).

SOUTH ISLAND: Maitai Valley, Nelson, Kirk s.n. (BRI); Northern Wairoa River, Cheeseman s.n. (K).

When describing *Nestegis lanceolata* for the first time Hooker distinguished two varieties without naming them: "var. α , foliis ovato-lanceolatis 3-uncialibus" and "var. β , foliis anguste lineari-ellipticis 2-uncialibus." Kirk (Trans. New Zealand Inst. 14: 377. 1882) gives additional characters for the two varieties, which he calls primary forms: " α . Bark of twigs whitish, prominently warted, leaves ovate, lanceolate, acuminate, segments of calyx linear," and " β . Bark of twigs dark, scarcely warted, leaves linear-lanceolate, racemes more slender than in var. α , segments of perianth broader." Certainly some of the specimens I have examined do have larger leaves than others, but two distinctly different leaf sizes do not seem evident and Allan in his recent *Flora* states that the distinction between the forms is not at all clear cut. In fact, when the length of leaves was measured on all the gatherings examined and cited above, it was found that there was continuous variation in this character and no disjunction into two groups whether the largest, smallest, or a typical leaf was chosen from each specimen; nor was any geographical pattern evident in the localities from which the larger leaved specimens had been collected. An examination of the inflorescences and calyces did not reveal any characters for the separation of two distinct entities either. However, observations in the field are required and one possibility which calls for investigation is the chance that the larger leaved plants are the result of hybridization between this species and another. According to Cockayne and Allen (Ann. Bot. 48: 38. 1934) "hybrids [with *Nestegis cunninghamii*] appear to be not uncommon in damaged forest" in the south of North Island where the two species are said to be common. Since no obvious hybrid material either of this or any other parentage has been seen in this investigation, it would be valuable to know whether these hybrids are sterile or fertile and, if the latter, to what degree. Any hybrid with *N. cunninghamii* might be expected to exhibit the characteristic prominent golden (at least in dried material) hairs of this species but these have not been seen in the variable material of *N. lanceolata*.

According to Allan (Fl. New Zealand 1: 546. 1961) the fruit of *Nestegis lanceolata* usually has two seeds per locule but in all the fruiting specimens I have seen there has been only a single seed, which is characteristic of all the genera closely allied to *Olea*.

The distribution of *Nestegis lanceolata* is wide in the North Island and in the South Island it has been recorded from the Wairoa Valley and from Kaituna and the Rai Valley (Cheeseman, Man. Fl. New Zealand, ed. 2. 719, 1925). The native names are Maire and White Maire.

In the herbarium at Kew there are two sheets named *Olea lanceolata* by Hooker from which the lectotype may be selected. These bear eight specimens representing a mixture of gatherings, with four or possibly six

entities between them; one sheet is annotated "var. α " (although this was later deleted) and the other "var. β ." In his diagnosis Hooker describes only the flower and not the fruit; in fact, the fruit is hardly mentioned at all in the protologue, so I have excluded the fruiting specimens from consideration in the choice of lectotype. There then remain four specimens, two with the larger leaves which would correspond to Hooker's var. α and two with the smaller leaves of var. β . In light of the reference by Cockayne and Allan (mentioned above) to hybridization, I have excluded the larger leaved specimens because of the nomenclatural confusion that would result should they be shown to represent plants of hybrid origin. Two specimens remain, both on the sheet labelled "var. α ." One, a mere scrap, is contained in a paper capsule labelled "Flowers of 2424" (a Colenso number?) the other, a slightly more adequate specimen in the bottom left-hand corner, is the one I have selected as lectotype. It is not individually labelled and may possibly be further material of no. 2424 or, alternatively, it may be the Sinclair material cited by Hooker in his protologue. There appears to be no material labelled as Sinclair's at Kew but this specimen certainly matches very closely sheets of Sinclair in the Edinburgh and Brisbane herbaria. Whoever collected it, it represents var. β and bears leaves 4 to 6 cm. long and a few male flowers with dehisced anthers.

3. *Nestegis cunninghamii* (Hooker f.) L. Johnson in Degener, New Ill. Fl. Hawaiian Is. 300. *Nestegis*. 1958.

Olea cunninghamii Hooker f. Fl. Nov.-Zeland. 1: 175. 1852 et Handbook New Zealand Fl. 186. 1864; Buchanan, Trans. New Zealand Inst. 6: 221. 1874; Kirk, Trans. New Zealand Inst. 14: 376. 1882 et Forest Fl. New Zealand, 103-105. *pl.* 59 & 59B. 1889; Laing & Blackwell, Plants New Zealand, 334, 335. 1906 et ed. 5. 355. 1950; Cheeseman, Man. New Zealand Fl. 437. 1906 et ed. 2. 718. 1925; Allan, New Zealand Trees & Shrubs, 132. 1928; Cockayne & Turner, Trees of New Zealand, 92, 154. 1928; Bailey & Bailey, Hortus, 423. 1930 et Hortus Second, 507. 1941; Gudex, Trans. Roy. Soc. New Zealand, 85: 58. 1957; Allan, Fl. New Zealand, 1: 545. 1961.

Gymnelaea cunninghamii (Hooker f.) L. Johnson, Contr. New S. Wales Natl. Herb. 2: 412. 1957; Allan, Fl. New Zealand, 1: 1025. 1961.

Tree to 20 m. tall (*vide* Kirk) with trunk to 1.5 m. in diameter (*vide* Kirk), monoecious or dioecious, branches pubescent or becoming glabrous with age. *Leaves* glabrous, petiole (4-)7-14(-17) mm. long, pubescent, at least when young; lamina coriaceous, narrowly lanceolate or sometimes narrowly ovate or elliptic (more or less linear-lanceolate when juvenile), (5.5-)7-12(-21) cm. long by (1.2-)1.5-3(-4.5) cm. broad (7-23 cm. long by (0.4-)0.7-1.6 cm. broad when juvenile); margin entire, slightly thickened; apex acute or occasionally almost obtuse, tip often blunt; base acute (narrowly cuneate in juvenile leaves); venation obscure, primary veins only just visible, 8-10 pairs (to 12 pairs in juvenile leaves or obscure); midrib sunk, pubescent at least when young. *Inflorescence* axillary, decussate, frequently borne below the leaves, 1 or occasionally 2

per axil, 1.5–4 cm. long, 9–19-flowered, stout, densely pubescent; bracts concave, ovate or lanceolate, 2.5–4 mm. long, early deciduous, glabrous or occasionally pubescent on the midrib toward the tip, especially the upper ones. Flowers unisexual or occasionally hermaphrodite (FIG. 3), pedicels 1–2.5 mm. long. *Calyx* glabrous, more or less campanulate, 2–3 mm. long, with 4 irregular, unequal, often more or less erose teeth, 0.5–1 mm. long, tube 1–2 mm. long. *Corolla* absent. *Stamens* 2, in male and hermaphrodite flowers, anthers 1.5–2 mm. long, with a barely discernible terminal appendage, filaments 1.5–3 mm. long; in female nonfunctional, anthers 0.5–2 mm. long, acute, on broad filaments 0.4–1.3 mm. long. *Ovary*, in female flowers 2–3.5 mm. long (in hermaphrodite (?) ca. 1 mm. long) with 2 stigmatic lobes 1–1.5 mm. long; in male flowers abortive, more or less conical 0.5–0.8 mm. long, somewhat bluntly bifid at the apex. *Drupe* ovoid or oblong-ovoid, slightly asymmetrical, 10–15 mm. long by 7–10 mm. broad, red (*vide* Cheeseman); endocarp hard, 0.3 mm. thick.

LECTOTYPE: New Zealand, without locality, *Colenso s.n.* (κ, ? isolectotype P).

New Zealand. NORTH ISLAND: Purua, Whangarei, Sept. 1899, *A.T.* (CHR 11047); Kaitaia, North Auckland, Sept. 1902, *Carse s.n.* (o); Upper Waihaha River, West Taupo, edge of mixed podocarp forest, 27 July 1950, *Poole* (CHR 79236); Volcanic Plateau, Hauhangatahi, 9 Jan. 1933, *Allan* (CHR 6578 & 6579 *p.p.*); N. W. slopes of Pureora, King Country, 820 m., 21 Jan. 1947, *Rawson* (CHR 56465); Maungapohatu, 18 March 1930, *Moore* (CHR 40774); Egmont, forest, ca. 400 m., Feb. 1960, *Druce* (CHR 86726–7); Scenic Reserve, Rongokaupo, near Ohakune, 16 March 1962, *Melville 6736* (CHR 130982–3); Makapoua Valley, Ruahine foothills, near Taihape, *Spiers* (CHR 129161); Ruahine–Cook district, Ruahine mountains above Table-Flat, 18 Nov. 1928, *Zotov* (CHR 360); Dress Circle, 5 Nov. 1928, *Zotov* (CHR 22673); Mauriceville, near Mt. Bruce, 5 Feb. 1945, *Zotov* (CHR 48666); Wairarapa, *Kirk s.n.* (BRI, GH); Dry River, Wairarapa, *Kirk* (CHR 118758); Ruamahanga, Wairarapa, May 1879, *Kirk 894* and *s.n.* (κ); Ruamahanga Basin, *Kirk s.n.* (A); Eastern Wairarapa, near “Pahaoa Pinnacles,” Pahaoa River, 25 Oct. 1953, *Mason 2537* (CHR 81796); S. W. Wairarapa, Lake Pounui, forest remnant, 3 Sept. 1960, *Macmillan* (CHR 129159); S. W. Wairarapa, Western Lake Reserve, forest edge, 3 Sept. 1960, *Moore* (CHR 129158 A & B); Upper Hutt, remnant tree enclosed in shrubby area, 14 Jan. 1953, *Healy 53/870* (CHR 80796a–e); near railway station, Silverstream, Hutt Valley, remnant tree by creek, 6 Dec. 1953, *Healy* (CHR 85913A & B); Pakuratahi, *Kirk 614* (κ) and 1 Nov. 1941, *Moore* (CHR 11038, 50035, & 50037); Barton’s Bush, Lower Hutt, 10 Oct. 1950, *Poole* (CHR 69138); Wallaceville, Research Station grounds, Sept. 1943, *Sinclair* (CHR 69387); behind Wallaceville laboratories, Wellington, 18 Sept. 1943, *Moore* (CHR 40121–2); Korokoro Domain, 7 Sept. 1952, *Hutson* (CHR 83395); Ohakune, near Wellington, taxad forest, 9 Oct. 1929, *Sledge 172* (κ); Garden of B. C. Aston, Wellington, 20 Sept. 1948, *Poole* (CHR 61878); Cape Palliser, *Kirk s.n.* (NSW). Without locality: *Colenso 712, 1798, and 2036* (κ), and *s.n.* (κ, lectotype, P, ?isolectotype); without collector (CHR 11037A & B).

Cultivated. U.S.A.: Golden Gate Park, San Francisco, California, spring 1931, *Walther s.n.* (A).

From each of the other New Zealand species *Nestegis cunninghamii* may be distinguished by its relatively stout, hairy inflorescence axes and pedicels, and its somewhat campanulate calyx. At least on dried material the hairs usually appear golden in color and although to a lesser or greater extent the other species bear scattered hairs on the axes they are never almost tomentose. *Nestegis montana* approaches this species in possessing a distinct calyx tube but it is smaller (less than 1 mm. long) and surrounds the androecium and gynoecium less than in *N. cunninghamii*. Another feature which may be used to distinguish material of this species is the way in which the midrib on the upper side of the leaf is sunk below the surface of the lamina. This is evident even in juvenile foliage which is also identifiable by the possession of at least a few characteristic hairs on the petioles or in their axils.

This species was early confused with *Nestegis apetala* because of its apetalous condition, but from my examination of the specimens cited above I do not believe it is the *Olea apetala* of Allan Cunningham as first suggested by Hooker in his *Flora Novae-Zelandiae*, a suggestion subsequently copied by others. Hooker was under the impression that *N. apetala* was confined to Norfolk Island and did not include it in either of his Floras, while the reference to *N. apetala* by Cunningham in his *Florae Insularum Novae Zelandiae Precursor* (Ann. Nat. Hist. 2: 46. 1839) cites two gatherings, one by Sir Joseph Banks in 1769 and the other his own, in 1826. Despite the citation of what is presumably these same two gatherings by Hooker in his protologue of this species, a duplicate of the Banks specimen in the Edinburgh herbarium shows it to be *N. apetala*, and although I have seen Cunningham material of this same species from Kew I have seen none of *N. cunninghamii*. It appears that Kirk was the first to draw attention to the fact that Vahl's species is, in fact, a native of New Zealand in his paper "*Notes on certain New Zealand plants not included in the Handbook of the New Zealand Flora*" (Trans. New Zealand Inst. 3: 165. 1871) and, as mentioned under *N. apetala*, Mueller went so far as to distinguish the Norfolk Island plant as a different species, *Olea endlicheri*.

Widely distributed in the North Island of New Zealand, this species is also recorded from the northernmost parts of South Island; according to Cheeseman (Man. New Zealand Fl. ed. 2. 718. 1925) from Marlborough, "extremely rare," Pelorus Sound, Kaikoura and Conway River, but I have seen no material from these localities. The native names given by Cheeseman are Maire, Mairerau-rui and Black Maire.

According to a note by Kirk attached to his specimen 894 at Kew, this species also has been confused with *Mida salicifolia* A. Cunn. of the Santalaceae (as *Santalum cunninghamii*). On the note he states that *Notelaea cunninghamii* "is the *Santalum cunninghamii* of Buchanan's List of Wellington Plants" (Trans. New Zealand Inst. 6: 223. 1874) and further that wood specimens of this species were distributed under this name. Unfortunately, as will be seen under *N. montana*, that species has also been confused with *Mida salicifolia*.

In selecting a lectotype, of the four sheets at Kew named *Olea cunning-*

hamii in Hooker's hand, I have chosen the Colenso sheet without a number, it is the only one bearing both flowers and fruit and it also carries a drawing of a male flower, all of which are described in the protologue. Unfortunately, however, the male flower is not that of this species but of *Nestegis apetala* and reference to its characteristics in the diagnosis and description of Hooker should be ignored.

4. *Nestegis montana* (Hooker f.) L. Johnson in Degener, New Ill. Fl. Hawaiian Is. 300. *Nestegis*. 1958.

Olea montana Hooker f. Fl. Nov.-Zeland. 1: 176. *pl.* 46A & B. 1852 et Handbook New Zealand Fl. 187. 1864; Kirk, Trans. New Zealand Inst. 14: 377. 1882 et Forest Fl. New Zealand, 39, 40. *pls.* 29, 30. 1889; Schimper, Pflanzen-Geogr. 506. 1898; Cheeseman, Man. New Zealand Fl. 438. 1906 et ed. 2. 719. 1925; Allan, New Zealand Trees & Shrubs, 133, 145. 1928; Cockayne & Turner, Trees of New Zealand, 94. 1928; Bailey & Bailey, Hortus, 423. 1930 et Hortus Second, 507. 1941; Gudex, Trans. Roy. Soc. New Zealand, 85: 58. 1957; Allan, New Zealand Fl. 1: 546. 1961.

Gymnelaea montana (Hooker f.) L. Johnson, Contr. New S. Wales Natl. Herb. 2: 413. 1957; Allan, Fl. New Zealand, 1: 1025. 1961.

Tree to 10 m. or more tall (to 16 m. *vide* Kirk), trunk to 60 cm. in diameter (*vide* Kirk), monoecious or dioecious, branches slender, glabrate or puberulous when young. *Leaves* glabrous, petioles 1.5–3 mm. long, glabrous, or minutely puberulous when young, usually dark green, more glossy than those of other species (*vide* Moore); lamina coriaceous, linear to very narrowly lanceolate, (2.5–)4–7(–8.5) cm. long by (0.2–)0.5–0.6(–0.7) cm. broad (juvenile leaves 5–13 cm. long by 0.2–0.7 mm. broad); margin entire, scarcely thickened; apex acute; base attenuate into the petiole; venation obscure, only the midrib visible above and below. *Inflorescence* axillary, decussate, often borne below the leaves, 1 (or 2) per axil, 1.5–3(–4) cm. long, (5–)7–17-flowered, scattered puberulous to glabrate, slender; bracts ovate-lanceolate, acute to acuminate, 1.5–3 mm. long, early deciduous. Flowers unisexual or hermaphrodite (FIG. 4), pedicels 1.5–3 mm. long. *Calyx* glabrous, somewhat campanulate, 1–1.5 mm. long with 4 irregular, unequal, somewhat erose teeth about 0.5–1 mm. long, and a distinct tube about 0.5 mm. long. *Corolla* absent. *Stamens*, in male and hermaphrodite (?) flowers 2–4 with anthers oblong-ovate, 1.3–2 mm. long on filaments 0.3–0.8 mm. long, absent in female flowers. *Ovary* in female or hermaphrodite (?) flowers 1–2 mm. long with 2 stigmatic lobes 0.7–1.5 mm. long, in male flowers abortive, more or less conical, ca. 0.2 mm. high. *Drupe* narrowly ovoid, about 6–9 mm. long, red (*vide* Cheeseman).

LECTOTYPE: New Zealand, without locality, *Colenso* 711 (K).

New Zealand. NORTH ISLAND: Wangaroa, 1834, *R. Cunningham* 563 p.p. (K) and *Kirk* 121 (K); Cowan's Bay Road, Rodney County, 5 Jan. 1962, *Moore* (CHR 125570); Kokohuia, Pukepoto, North Auckland, ca. 300 m., Oct. 1915, *Carse s.n.* (o); Waitakerei, Auckland, Nov. 1881, *Cheeseman s.n.* (NY); Titirangi Range, *Cheeseman* 95 (K), Oct. 1870, *Cheeseman s.n.* (E, NSW) and Sept. 1872, *Cheeseman s.n.* (NY); Swanson, rain forest, *Mason* (CHR 22124); Rangitoto,

without collector, (CHR 8192); Oratia, near Auckland, Sept. 1929, *Meebold* 5337 (NY); Maraeroa-Mangapehi Road, King Country, cut-over bush, ca. 600 m., 27 Jan. 1947, *Rawson* (CHR 56513); Tokaanu-Taumarunui Road, near Kuratau Stream, 20 Jan. 1950, *Hamlin* (CHR 69844); Ruahine-Cook district, near Mt. Matthews, ca. 300 m., 25 Dec. 1932, *Zotov* (CHR 6492); Foxton, Kahikatea, forest remnant between high consolidated dunes, April 1940, *Poole* (CHR 23756); Mt. Wainui, near Wellington, forest margin, ca. 200 m., 17 Jan. 1942, without collector (CHR 95349); Makara, *Kirk s.n.* (A); Hurunuiorangi village, Wairarapa valley, 1849, *Colenso* 1119 (K); Turanganui valley, Wairarapa, Feb. 1947, *Druce* (CHR 82176); Turanganui River, Haurangi Mountains, Wairarapa, 20 Feb. 1947, *Zotov* (CHR 59307); Dry River, Wairarapa, *Kirk s.n.* (GH); Ruamahanga, Wairarapa, *Kirk* (CHR 118757); Wainuioru River, Eastern Wairarapa, ca. 1½ miles above junction with Pahaoa River, 26 Nov. 1953, *Mason* 2546 (CHR 84707); E. Wairarapa, 7 miles N. E. of Hinakura, forest, ca. 150 m., 25 Oct. 1953, *Druce* (CHR 82400); Cascades, without collector (CHR 8180). Without locality: *A. Cunningham s.n.* (K), 1797, 2032, & 2033 (K) and 1847, *Colenso* 711 (K, lectotype).

SOUTH ISLAND: Snowden's Bush, Nelson, *Gibbs* (CHR 118756).

The distribution of this species is very similar to that of *Nestegis lanceolata*. It occurs widely in the North Island and has also been recorded from south of the Cook Strait: from the Rai Valley and from near Brightwater (Cheeseman, *Man. Fl. New Zealand*, ed. 2. 719. 1925), although I have only seen the one gathering cited above. The native names are Orooro and Narrowleaved Maire.

Of all the New Zealand species *Nestegis montana* possesses the narrowest foliage and in this is distinct from each of the others. Its juvenile leaves are also narrow, and partly for this reason the species has been confused with *Mida salicifolia* A. Cunn. of the Santalaceae (as has *N. cunninghamii*, see above under that species). At Kew one of the specimens of *N. montana* exhibiting juvenile leaves originally bore the name *Metrosideros ? salicifolia* A. Cunn. This was collected at Wangaroa by Richard Cunningham (number 563), the type locality and number of *M. salicifolia* (*Ann. Nat. Hist.* 3: 114. 1839). Furthermore Hooker, along with his original description and plate, illustrated (as his fig. C) a pair of leaves of this same species saying he now suspected they were *Mida salicifolia*. The specimen from which this figure was taken is attached to one of the sheets named by Hooker.

There are six sheets at Kew bearing the name *Olea montana* in Hooker's hand, which, therefore, have to be taken into consideration in choosing a lectotype. Three of them are Colenso gatherings in fruit only, so I have selected another sheet which bears material exhibiting the greatest number of the characteristics mentioned by Hooker in his protologue. This is *Colenso* 711 with juvenile and adult shoots, flowering material, and the original pencil drawings which became figures 1 to 5, and illustrate male flowers and their parts (although originally published as female). The fruit (figures 6 to 9) was illustrated from *Colenso* 2032 which bears the original pencil sketch but, apart from showing adult foliage and fruiting inflorescences, does not exhibit as wide a range of characteristics as *Colenso* 711.